
Inclusion of *Tricalistra* and *Gonioscypha muricata* in *Tupistra* (Convallariaceae)

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ABSTRACT. *Tricalistra*, a monotypic genus comprising *T. ochracea*, and *Gonioscypha muricata* were found not to differ markedly from *Tupistra*. They share many essentially similar characteristics in both vegetative and reproductive organs. *Tricalistra* and *G. muricata* are therefore included in *Tupistra* as *Tupistra ochracea* (Ridley) N. Tanaka and *T. muricata* (Gagnepain) N. Tanaka, respectively.

Key words: Convallariaceae, *Gonioscypha*, Southeast Asia, *Tricalistra*, *Tupistra*.

The genus *Tricalistra* was originally described by Ridley (1909) with the single species *T. ochracea* Ridley from the Malay Peninsula. According to Ridley (1909, 1924), the genus differs from its closest congener, *Tupistra* Ker Gawler, known mainly from Southeast Asia, in the absence of any style (vs. one style) and by the trilobed (vs. discoid or clubbed) stigma being sessile on the truncate top of the short ovary. Jessop (1979) also distinguished the two genera by their styles and stigmas; in *Tricalistra* the style is absent and the stigmas are distinctly 3, while in *Tupistra* the style is distinct and the stigma is simple or indistinctly lobed. Conran and Tamura (1998) regarded *Tricalistra* as differing from *Tupistra* by the absence of the style (vs. long style) and in the hippocrepiform stigma (vs. peltate to fungilliform stigma). All these authors were consistent in regarding the style of *Tricalistra* as absent.

A pistil as well as other floral parts of *Tricalistra ochracea* are illustrated in Figure 1 (A–D). As shown there, the pistil of this species is columnar (Fig. 1B). The ovary (Fig. 1B, ov) is short (ca. 0.6–0.8 mm long) and confined only to the basal portion of the pistil (4–5 mm long). The style (Fig. 1B, sl) is incrassate and long, occupying most of the pistil, and is scarcely differentiated externally from the ovary part. The stigma (Fig. 1B, st; 1C) is nearly as broad as or slightly broader than the style and ovary. Not being attenuate, the style may appear to be absent, as the previous authors reported (see above), but it is apparently present at closer examination. The pistils of *Tupistra* are also more or

less columnar with an incrassate long style (Hooker, 1831; Kunth, 1850), being basically similar to those of *Tricalistra*. The stigma of *Tricalistra* is certainly trilobed, as Ridley (1909, 1924) reported, and the lobes are orbicular to ovate or hippocrepiform (Fig. 1B, st; 1C). Trilobed stigmas are, however, also found in some species of *Tupistra*; e.g., *T. albiflora* K. Larsen from Thailand, *T. squalida* Ker Gawler (Ker Gawler, 1814) from Amboyna (Ambon), Indonesia [the provenance is, however, questioned by some botanists (Blume, 1834; Jessop, 1979), and the natural habitat of this species is currently unknown], and *T. nutans* Wallich in J. Lindley (Hooker, 1831) from Eastern India.

Ridley (1909, 1924) reported that the fruit of *Tricalistra* is drupaceous and one-seeded. Jessop (1979) and Conran and Tamura (1998) reported it to be a drupe with a single seed. On the other hand, the fruit of *Tupistra* is reported to be a berry (e.g., Kurz, 1875; Wan, 1984; Liang & Tamura, 2000). It usually contains 1 to 3 seeds. As far as I could tell from examination, the fruit of *Tricalistra* (*Nur* 32725, GH, L) is morphologically very similar to that of *Tupistra*. It bears a thick, carnosic pericarp and not a stony or hard endocarp, as in *Tupistra* (fruits of *Tupistra albiflora* are figured in Larsen, 1961). This indicates that their fruits are of the same kind, falling under the category of a berry. Ridley (1909) noted that he was not able to find a ripe fruit of *Tricalistra*. If he had seen ripe fruits, he may not have regarded the fruit of *Tricalistra* as drupaceous. He did state that the fruit of *Tricalistra* is similar to that of *Tupistra*. One fruit of *Tricalistra* I examined (*Nur* 32725, GH) contained one seed, coinciding with the previous reports. It is desirable, however, to examine more samples in order to see if the fruit of *Tricalistra* is consistently one-seeded.

According to Ridley (1909), the section of the ovary of *Tricalistra* shows traces of three carpels, but only one contains any ovules (actually 2 ovules). He therefore regarded the ovary as one-celled. Jessop (1979) described the ovary as one-celled, containing (2 or) 4 discoid ovules but with traces of two further carpels. Conran and Tamura's

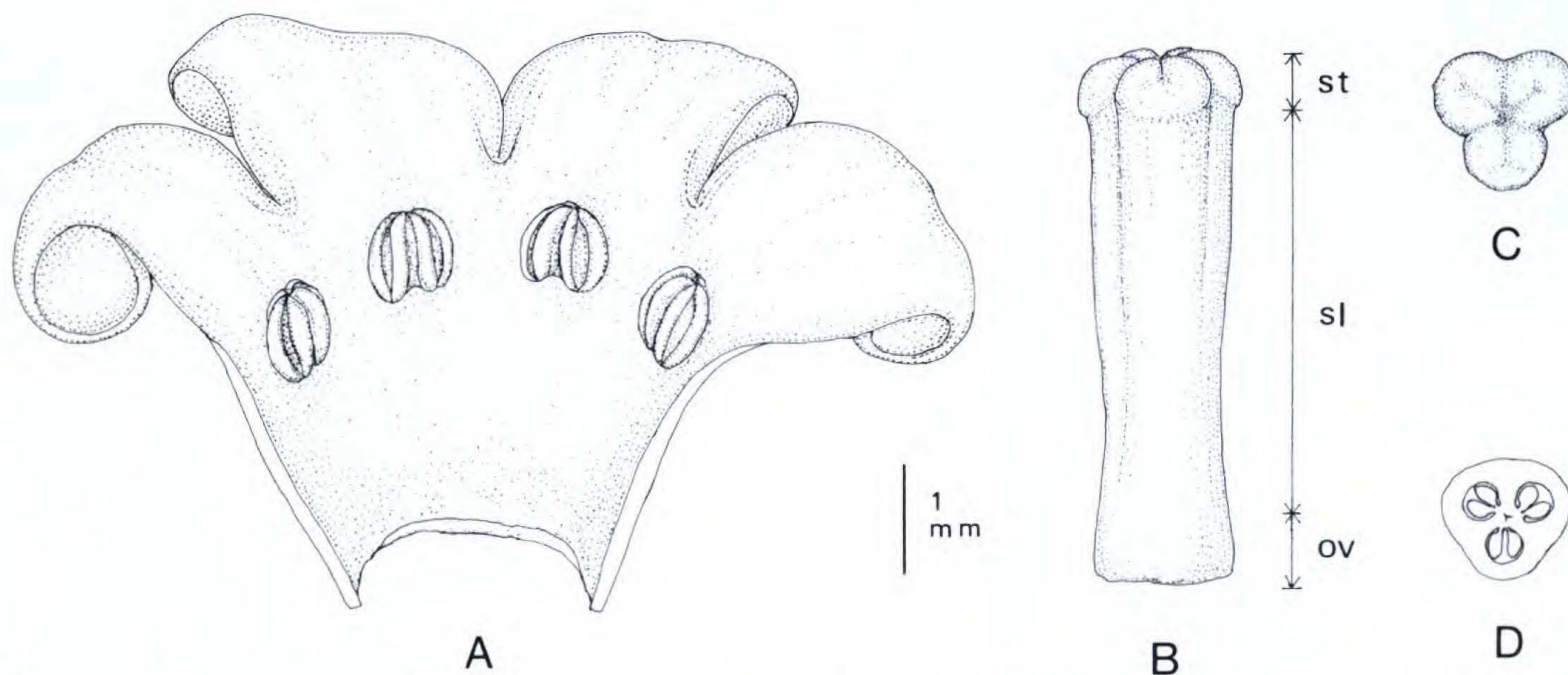


Figure 1. *Tupistra ochracea* (Ridley) N. Tanaka. —A. Partial flower cut longitudinally and slightly opened with pistil and part of perianth removed. —B. Longitudinal view of pistil. ov: ovary. sl: style. st: stigma. —C. Stigma in front view. —D. Diagram of cross section of ovary. Drawn by Noriyuki Tanaka: A, D from *H. N. Ridley 13692* (BM); B, C from *A. H. Batten Pooll s. n.* (SING).

description (1998) of the ovary is almost the same as Jessop's. In my observations, contrary to their reports, the ovary showed 3 normally developed locules, each containing 2 collateral ovules (Fig. 1D; *Batten Pool s.n.*, SING; *Nur 32725*, SING; *Ridley 13692*, BM). The ovary of *Tupistra* is also trilocular, each locule containing 2 collateral ovules (Hooker, 1831; Blume, 1834; Kunth, 1850). The result obtained herein shows that the two genera share the same locular feature of the ovary. In order to solve the above discrepancy between the present observation and the previous reports, further survey based on more specimens is needed.

As far as the present observations are concerned, *Tricalistra* and *Tupistra* do not seem to be distinct in any significant way. They share many essentially similar features in both vegetative and reproductive organs [e.g., tuberous rhizomes with cord-like roots, basal foliage leaves taller than flowering stems, comparatively large narrowly elliptic or oblanceolate leaf-blades attenuate into petiole, flowers borne in terminal spike, and fleshy more or less campanulate perianths (Fig. 1A)], and therefore can be regarded as congeneric. Considering their close proximity in various characters, the two genera may not even deserve a sectional delimitation.

Meanwhile, *Gonioscypha muricata* was originally described by Gagnepain (1934) from Laos. He reported that the fruit is densely tuberculate-muricate, capsular, and loculicidally dehiscent. However, from my examination of the type specimen, the fruits are hardly distinguishable from those of *Tupistra* and seem to be berries. The fruits of *Tupistra* are also often tuberculate-muricate (e.g., *Tup-*

istra longispica Y. Wan, as described in Wan, 1984). *Gonioscypha muricata* coincides well with *Tupistra* in all other respects, including vegetative and floral characters (e.g., shape of leaf blades, bracts, perianths, pistils, and stamens). There are no grounds to regard *G. muricata* as generically distinct from *Tupistra*.

From the reasons stated above, it seems more appropriate to transfer *Tricalistra ochracea* and *Gonioscypha muricata* to *Tupistra* as follows.

Tupistra ochracea (Ridley) N. Tanaka, comb. nov.
Basionym: *Tricalistra ochracea* Ridley, J. Fed. Malay States Mus. 4: 83. 1909. TYPE: Indonesia. Pahang: Telom, Nov. 1900, *H. N. Ridley 13692* (lectotype, designated here, SING; isotypes, BM, K photo).

Other selected specimens examined. MALAYSIA. Malay Peninsula. **Pahang:** Cameron Highlands, Nov. 1939–Jan. 1940, *A. H. Batten Pooll s.n.* (SING 080488); Cameron Highlands (Sungai Bow, Bow Plantation), (ca.) 3700 ft., 23 Apr. 1937, *Md. Nur 32725* (GH, L 0068835, SING 052253).

Tupistra muricata (Gagnepain) N. Tanaka, comb. nov. Basionym: *Gonioscypha muricata* Gagnepain, Bull. Soc. Bot. France 81: 287. 1934. TYPE: Laos. Pak-lay, 1866–1868, *C. Thorel 3314* (holotype, P).

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